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ABSTRACT

This guide contains 30 technology learning activities. Activities may contain all or some of the following: an introduction, objectives, materials and equipment, challenges, limitations, notes and investigations, resources and references used, and evaluation ideas. Activity titles are: (1) Occupations in Construction Technology; (2) Designing a Beam; (3) Simple Machines; (4) Packaging: More Than Just a Box; (5) Communications: Getting the Message across with Advertising; (6) Measuring Inaccessible Distances; (7) Alternative Energy Sources: Designing a Wind Powered Generator; (8) Designing a Hot Dog Heater Using Solar Energy; (9) Writing Radio Ad Scripts; (10) Building a Bottle Rocket; (11) Site Selection for Business and Industry; (12) Bar Coding; (13) The Green Revolution in Transportation; (14) Resource Recovery; (15) Walking Fingers: The Yellow Pages; (16) Adventures in Technology; (17) The Trip Home; (18) The Business Card; (19) Does the Shoe Fit? (20) Writing Dynamic Learning Activities; (21) Technology is Building in the First Grade; (22) Sound, Sensors, and Logic; (23) Weather Forecast; (24) The Secrets of the Iceman; (25) Construction/Manufacturing; (26) Graphic Advertising Utilizing Paper Engineering; (27) Emergency Shelter; (28) The Cellular Connection; (29) Columbus Sailed the Ocean Blue; and (30) Tax or Regulate. (MKR)

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ED 381 386

TECHNOLOGY LEARNING ACTIVITIES I

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Technology Learning Activities I

Published by the International Technology Education Association

Table of Contents

1 Occupations in Construction Technology
Fred Hadley

1 Designing a Beam
Fred Hadley

2 Simple Machines
Fred Hadley

3 Packaging: More Than Just A Box
Walter F. Deal, III

4 Communications: Getting the Message Across With Advertising
Walter F. Deal, III

5 Measuring Inaccessible Distances
Fred Hadley

6 Alternative Energy Sources: Designing a Wind Powered Generator
Fred Hadley

7 Designing a Hot Dog Heater Using Solar Energy
Fred Hadley

8 Writing Radio Ad Scripts
Walter F. Deal, III

10 Building a Bottle Rocket
Fred Hadley

11 Site Selection for Business and Industry
Walter F. Deal, III

12 Bar Coding
Beth Bulcher-Willner

13 The Green Revolution in Transportation
Walter F. Deal, III

14 Resource Recovery
Fred Hadley

15 Walking Fingers: The Yellow Pages
Walter F. Deal

16 Adventures in Technology
Walter F. Deal, III

17 The Trip Home
Walter F. Deal, III

18 The Business Card
Walter F. Deal, III

19 Does the Shoe Fit?
Walter F. Deal, III

20 Writing Dynamic Learning Activities
John M. Ritz, DTE and Walter F. Deal, III

22 Technology is Building in the First Grade
Cindy Etchison and Toni Farthing

23 Sound, Sensors and Logic
Walter F. Deal, III

24 Weather Forecast
K. George Skena

25 The Secrets of the Iceman
Walter F. Deal, III

26 Construction/Manufacturing
David A. Baird

27 Graphic Advertising Utilizing Paper Engineering
Dan Brown

29 Emergency Shelter
Walter F. Deal, III

30 The Cellular Connection
Walter F. Deal, III

31 Columbus Sailed the Ocean Blue
Cindy Etchison

32 Tax or Regulate
Walter F. Deal, III

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Occupations in Construction Technology

Fred Hadley

Context

Of all the resources in construction technology, humans are the most important. They bring a wide variety of skills, attitudes, and types of knowledge to each construction site. It is people who must do the planning, initiate ideas, and accomplish the processes involved in construction activities. A large number of occupations will be represented at any given construction site over the duration of the entire project.

Objectives

Conduct an interview.

Perform research on construction occupations.

Compile a list of occupations in construction.

Define some duties for each occupation.

Demonstrate effective writing skills.

Materials and Equipment

Pencil and paper

Challenge

Visit a local construction site. Use an interview technique to determine the occupations required for the project. In your list, also include persons whose occupations were or will be required for the successful completion of the construction project.

Limitations

Have your instructor help you obtain permission and make the proper arrangements before going to a construction site.

Try to interview a person in a management role (i.e. foreman, superintendent, etc.).

Notes and Investigations

Include observations you made of occupations engaged at the construction site. Record any additional information here that you may wish to save for inclusion in your written report.

Resources and References Used

For example, Exploring Production Systems. Ritz, Hadley and Bonebrake, 1990.

Evaluation

Compile a brief report on your interview. Include the name and duties of the person you talked to. Provide a list in the report of the occupations required at the site you visited and some of the duties associated with each.

Designing A Beam

Fred Hadley

Context

Beams are used to form the skeletons for many types of structures (i.e. bridges, skyscrapers, towers, etc.). The size and weight of these beams is not nearly as important as their load carrying capacities. With proper design, even light-weight materials may sometimes be fabricated to produce beams with considerable strength.

Objectives

Demonstrate problem solving skills.

Perform research on beam design (shapes, materials, etc.). Apply math and science skills during technological activities.

Construct a beam using light-weight materials.

Demonstrate effective writing skills.

Materials and Equipment

1—14" × 8-½" piece of paper or card stock

White glue

Scissors or Exacto knife

Challenge

Working in a group of two or three students and using a piece of paper or card stock supplied by your instructor, design and construct a beam that will span an eight inch (8″) space with one-half inch (½″) of bearing surface on each end. Your group's beam should support as much weight as possible.

Limitations

Only white glue (i.e. Elmer's, etc.) may be used.

No laminating is permitted.

No pins, reinforcing rods, paper clips, etc. may remain in your completed beam after the glue dries.

Use only materials designated by your instructor (Note: All groups should use identical materials).

Notes and Investigations

Attach sketches, drawings, additional information, etc.

Evaluation (includes feedback)

During a class activity period, each group will test their design by gradually adding weight to the beam while it spans the eight inch gap.

1. Which beam design supported the most weight in your class?

2. Why did some designs function better than others?

3. What does this activity suggest regarding the use of light-weight materials in actual construction?

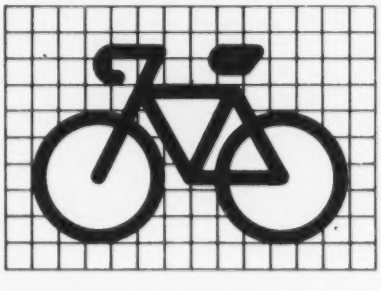
4. Prepare a written technological report on the types of beams and their uses in construction.

Simple Machines

Fred Hadley

Context

All machines are based on the use of one or more of the six simple machines: the wheel, lever, inclined plane, pulley, screw, and wedge. Bicycles use several of these to adapt human muscle power into a form of transportation. By combining the bicycle's simple machines into different configurations, other productive uses may be found.



Objectives

Demonstrate problem solving skills.

Define potential and kinetic energy.

Identify simple machines.

Describe applications of simple machines.

Analyze different gear ratios and their effects.

Construct a productive complex machine.

Demonstrate effective writing skills.

Apply math and science skills during technological activities.

Materials and Equipment

1—Operable bicycle (Others identified by students.)

Challenge

Working in a group of two or three students, use a bicycle's simple machines to design and/or construct other productive uses for the kinetic energy normally transmitted to the rear wheel.

Limitations

Restoration of the bicycle to its original condition must be possible.

Notes and Investigations

Attach sketches, drawings, additional information, etc.

Evaluation (includes feedback)

The following questions should be addressed in a brief written report to be presented orally in class:

1. What simple machines did your group identify in the bicycle?

2. For what practical purpose could your design/project be used?

3. What was the effect of different wheel diameters? Gear ratios?

4. Were there modifications to the bicycle's basic design that you were unable to make because of the "Limitations" which would have improved your efforts? Explain.

Packaging: More Than Just a Box!

Walter F. Deal, III

Context

Packaging plays an important role in the marketing and distribution of products. In today's world of mass marketing and self-service, a product package is much more than just a container. Packaging may be made from a wide variety of materials including paper and related products, plastics, glass, wood, composites, and metals. Specialized packing includes glass bottles for expensive perfumes, plastic pump containers for tooth pastes, microwavable containers for foods, as well as resealable foil packaging for cereal boxes. The design, shapes, colors, and materials represent considerable efforts by companies to produce functional and attractive packaging design.

Packages for products must be designed to take several factors into account. First the package must protect the contents. Every other consideration is secondary to the function of the package as a utilitarian container. Second, a package design must meet reasonable cost standards because in many cases the costs of packaging is a major expense for most firms. Once these two requirements of package protection and costs have been satisfactorily met, marketing and advertising considerations can be undertaken.

The functional and aesthetic parts of a package design are directed toward a package design that is easy to handle and store, is durable, does not soil readily, stacks neatly, and is suitable for its contents. Color, transparent windows, text, and graphics are used to make a product package more attractive to potential buyers of the product. Additionally, The Fair Packaging and Labeling Act of 1966 states that packaging and labeling should enable consumers to obtain accurate information as to the quality of the contents and should enable the consumer to make value comparisons.

Objectives

Apply problem solving skills to develop a package design.

Develop critical thinking skills.

Demonstrate design and planning skills.

Use technology to solve a design problem.

Apply math skills in designing geometrical shapes.

Materials

Paper, plastic wrap, cellophane, or other selected packaging mateirals, pencils, colored markers, scissors, clip art, glue stick, basic drawing tools, or computer, drawing/paint or CAD software and electronic clip art, and other materials as available.

Challenge

Companies frequently contract with advertising and design firms to design packaging for their products. Imagine that your technology class is a design firm that specializes in product packaging. With the class divided into teams of three persons each, your challenge is to design and prepare a package prototype for a new cereal (or other product selected by the class) that is to be marketed by a large breakfast cereal company. Package design proposals are to be presented to the cereal manufacturer's marketing team (a group of three students). Presentations should include the features of the package design, materials, environmental considerations, and a prototype.

Traditional package designers use colored markers and paper to brainstorm package design concepts. New technologies for designing packages use computers that allow for rapid changes in color, shape, and graphics. Sketches and drawings are then used to make actual size prototypes for evaluation and review potential package designs.

Notes and Investigations

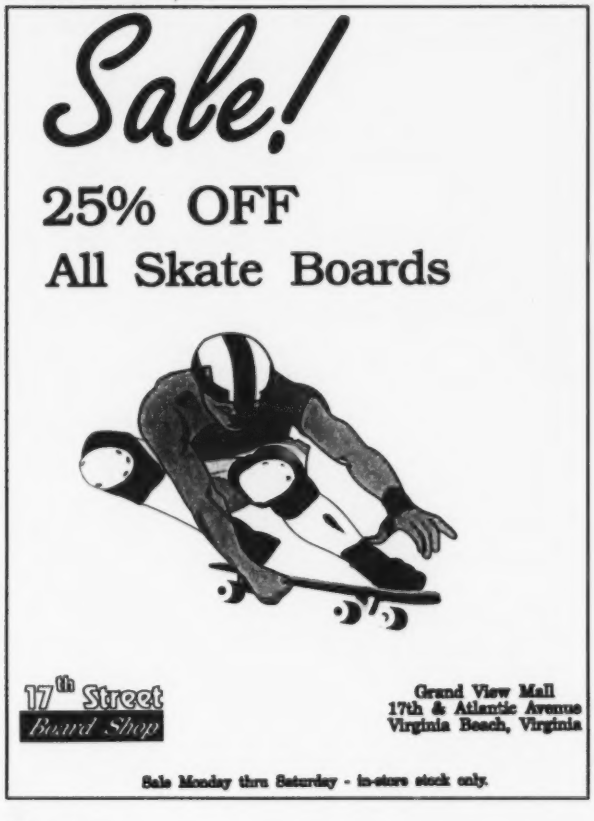
Sketch package designs. Experiment with different layouts using index or other available paper stocks that can be cut, folded, and fastened with an adhesive. Windows, bubble packaging, recloseable flaps or tops should be considered where appropriate.

Evaluation (includes feedback)

1. Will your package design adequately protect the contents of your package?
2. Assess the impact that packaging has on consumers in making purchases.
3. What techniques or technologies did your group use to prepare your package design?
4. Does your package apply good design and layout principles?
5. Will your package attract the interest of consumers?

Communications: Getting the Message Across with Advertising

Walter F. Deal, III



Context

What does the word advertising bring to mind? TV and radio commercials? Magazine ads? Newspaper ads? Michael Jordan and athletic shoes? Certainly all of these are forms of advertising. You may wonder how much money is spent on advertising or for what other purposes the money could be spent. Business and industry spend more than $100 billion a year on advertising. We are presented with advertising from when we awaken in the morning to our radio alarm clocks, through the evening TV programs that we watch for entertainment.

Advertising is part of our social and cultural heritage in the United States. Advertising may attempt to create an awareness of a product, introduce new products into the market, boost unsuccessful brands, promote changes in consumer attitudes, provide support to a sales force, or encourage a response from consumers (coupons, rebates, special offers, etc.). Advertising is a communication process that manufacturers and businesses use to inform consumers about their product for the purpose of increasing sales. Advertising is a communications activity that is part of a large marketing strategy.

Objectives

Define advertising.

Assess the impact that advertising has on consumers.

Use brainstorming techniques to solve all communication problems.

Use technology to create an information product.

Apply design and layout skills.

Demonstrate effective writing skills.

Materials

Paper or illustration board, pencils, colored markers, clip art, glue stick, or computer, page composition software and electronic clip art, or video camera, blank VCR tape, and player, and other materials as available.

Challenge

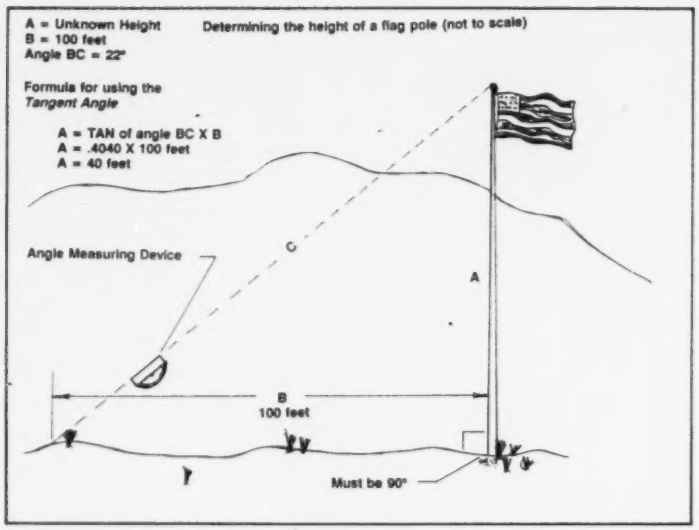
Preparing effective advertising is an art and skill of persuasion. The class should select a consumer product of their choice and a target market to direct an advertisement. The structure of an ad should include a promise of benefit (the headline), spelling out of the promise (subheadline), amplification of the story as needed, proof of the claim, and should direct the consumer to take action (the product or service).

The class should be organized into various groups of three students and assigned a particular media to use. The media may include radio, TV, magazine, newspaper, outdoor media (bill boards) or other forms of advertising. A sample newspaper ad is shown to illustrate the structure of an advertising.

Continued on page 9

Measuring Inaccessible Distances

Fred Hadley



Context

Contractors, planners, estimators, and others engaged in many technological fields often need to obtain measurements of distances that are not practically obtainable. For example, a painting contractor might need to know the height of a water tower or flagpole in order to estimate the quantity of paint that would be required for a job. Or, the distance across a river or gorge might be required for planners to design a certain project. All these inaccessible distances or heights are all easily calculated using the tangent angle method. Similarly, if your technology class launches rockets during its study of transportation technology, their maximum altitudes can be determined using the same method.

Objectives

Demonstrate problem solving skills.

Design a tangent angle measuring device.

Apply math and science skills during technological activities.

Materials and Equipment

Protractor, assorted technology lab hardware and materials, Table of Trigonometric Ratios (may be found in a plane geometry textbook—1 per class; others identified by students.)

Challenge

Working in pairs, design and construct a device for measuring a tangent angle. Using this device and a known horizontal distance of 100 to 200-feet, determine distances and heights assigned by your instructor. Use the 'tangent angle' column in your table of trigonometric ratios. Examples: maximum rocket altitude, the height of your school, the distance across a thoroughfare or river, a flagpole or tower, etc. See the accompanying sketch for a typical activity layout and the formula used.

Notes and Investigations

Attach sketches, drawings, additional information, etc.

Evaluation (includes feedback)

1. Compare the results you and your partner obtained with those of others who measured the same distances.

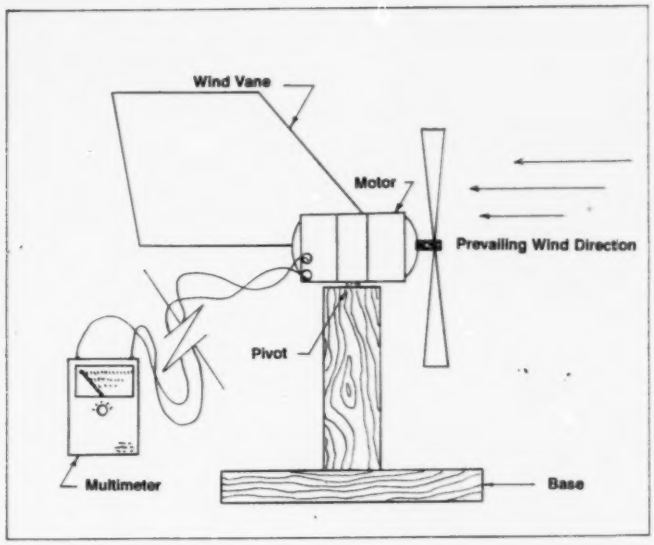
2. Did everyone obtain the same results? Why do you think this is true? What does this tell you about the accuracy of this method?

3. After seeing the tangent angle measuring devices of the other teams, do you believe your design could be improved? How?

4. Prepare a written technological report on this activity. Include your comments on the accuracy of the results obtained. Why do you believe this to be true?

Alternative Energy Sources
Designing A Wind Powered Generator

Fred Hadley



Context

One of the oldest and purest forms of energy is wind power. In addition to its being free and abundant all over the world, it does not pollute. Wind energy also does not deplete other resources. The wind is presently being used in some areas to produce electricity, but not to any great degree. Although the potential for its use is tremendous, wind energy is limited by two major problems. First, no means has been devised for storage and secondly, the supply is inconsistent.

Objectives

Demonstrate the practicality of using the wind to produce electricity.

Demonstrate problem solving skills.

Describe the limitations of wind energy.

Research uses of wind energy today.

Demonstrate effective writing skills.

Materials and Equipment

Small 1½ to 3 volt DC motor (available from Radio Shack, Kelvin, etc), multimeter (VOM) or digital voltmeter (DVN), wire, sheet metal or other construction materials, miscellaneous lab hardware, (Others identified by students).

Challenge

Working in a group of two or three students, design and construct a wind-powered generator similar to the one shown in the accompanying sketch. Your design should allow the windmill to automatically turn whenever the wind changes direction. Use a multimeter, set to a low voltage scale, to measure relative changes in voltage produced by various wind velocities.

Notes and Investigations

Attach sketches, drawings, additional information, etc.

Evaluation (includes feedback)

After the various class designs have been tested, respond to the following:

1. Compare the results obtained from the different wind generators.

2. Discuss and critique the performance of different designs.

3. What was the effect, if any, of changes in the voltage produced as wind velocities changed?

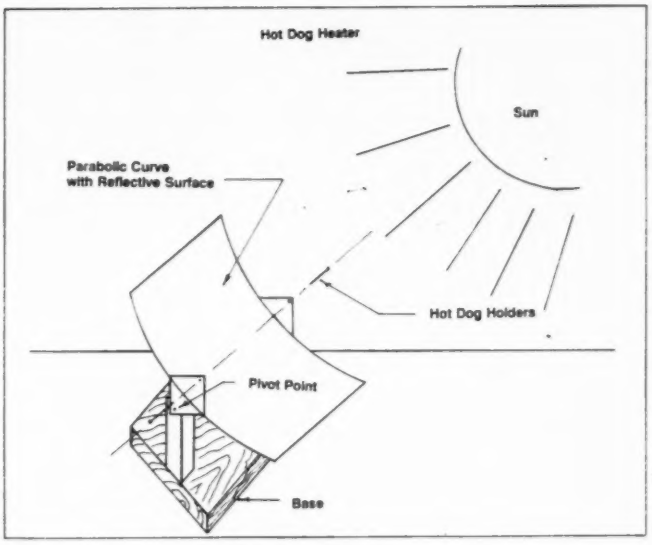
4. What effect did different propeller diameters or design have on wind generator performance?

5. Determine through class discussion why some designs performed better than others.

6. Prepare a written technical report on the use of wind power today.

Alternative Energy Sources
Designing A Hot Dog Heater Using Solar Energy

Fred Hadley



Context

Energy given off by our sun, called solar energy, is the source of all forms of energy on our planet. It is limitless, at least for the next five billion years or so. If this energy could be practically harnessed, it could easily supply all of Earth's energy needs. Presently, both passive and active solar collection systems are being used to convert the sun's energy into heat. Passive systems are relatively inactive in their operation. Examples include designing and orienting structures to maximize the effects of solar energy from the sun's rays. Active systems are those that collect, store and distribute solar energy through the use of pumps, fans and other equipment.

Objectives

Demonstrate problem solving skills.

Apply math and science skills to solve technological problems.

Define active and passive solar energy collection systems.

Describe the effects of concentrations of solar energy.

Describe the environmental impact in using clean energy resources.

Construct a passive solar collection device.

Demonstrate effective writing skills.

Materials and Equipment

Aluminum foil or other reflective material, typical lab materials (wood, screws, glue, etc.), thermometer, (others identified by students).

Challenge

Working with another student, design and construct a passive solar collection device, such as the "Hot Dog Heater" shown in the accompanying sketch. Test your design with the thermometer before actually cooking a hot dog.

Notes and Investigations

Attach sketches, drawings, additional information, etc.

Evaluation (includes feedback)

1. Compare and assess results of the different designs used in your class.

2. Discuss and critique your class's successes and failures (if any).

3. Prepare a written technical report on passive and active solar collection systems used in the construction industry today.

4. Give an oral presentation on a new development in the use of solar energy.

Writing Radio Ad Scripts

Walter F. Deal, III

Context

Radio is a magical medium! With a few sounds, some music, and voices, you can capture the listeners imagination, and transport it anywhere in the world. In this activity we are going to write and produce a radio commercial.

While we listen to radio for entertainment, it also is educational and informative. Radio programs are sponsored by companies or advertisers that want listeners to know about their products. The messages or advertisements that you listen to on the radio are special stories or scripts that are very short. They must capture the listeners' imagination and encourage them the buy a product or service that is being advertised.

When we hear an advertisement on the radio we can imagine what we are listening to and seeing in our minds. For example, when we listen to a MacDonalds'® advertisement, we can imagine the golden arches or the sound of a Pepsi Cola® pouring into a glass in a Pepsi Cola® advertisement!

Objectives

Demonstrate effective writing skills.
Demonstrate problem solving skills.
Use computer technology to assist in solving an information problem.

Materials and Equipment

Dictionary, grammar or style book, computer and word processing software, tape recorder and blank tape, and background music source.

Challenge

Radio advertisements are very short! They last from 10 to 60 seconds. The advertisements that we write must be simple and clearly written. When writing advertisements, there are several suggestions that we should follow. They include:

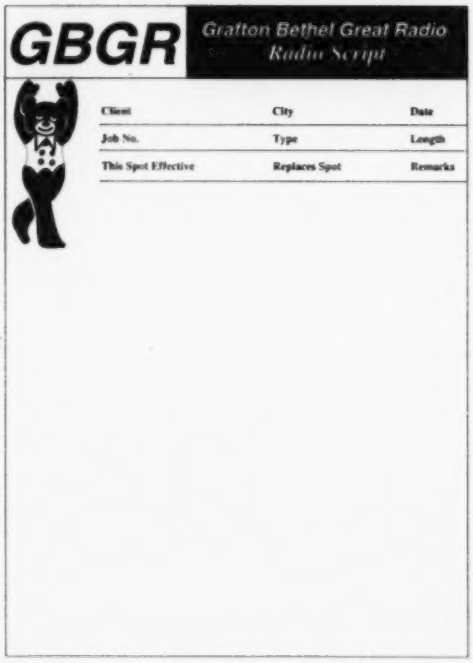
Simple—Choose one central idea. Don't confuse the listener by including too many points in your copy (story).

Clarity—Keep your ad story on-track. A good test: would your commercial be hurt by leaving out extra words?

Personal—Write and read your commercial as if you were talking to someone. Use a warm personal tone of voice that is friendly.

Pleasantness—Be pleasant, just like you were talking among friends.

Believable—Your advertising copy must be believable. Exaggerations and overstatements should not be made.



Interesting—Your advertising copy should be interesting and cause the audience to want to listen to your commercial. Add some humor or music.

Action—Your advertisement should encourage the consumer to buy the product that you are advertising. Don't forget to mention the name of your product frequently during the ad!

Production Techniques

Radio is a medium of words and music. People must use their imagination while they are listening to radios. Radio, unlike television, relies on people to write advertising copy that people will hear. Television, books, and magazines have pictures that will capture the attention of the people using them. Some techniques that can be used to preparing radio ads are:

Single announcer—One person reads the script. The person must sound believable and friendly.

Two-announcer—Two people read a single script that has parts written for each person. It is really two people talking to each other about a product that they like and want the listeners to buy.

Jingle-announcer—A song or jingle can be written to explain the benefits of a product. Songs are easily remembered by listeners and are a good technique for making advertisements that people will remember.

Writing Your Advertising Copy

Using a computer to write advertising copy makes it easy and fun! You can change and rewrite your story so that it sounds just right. Just like working at an advertising agency, you will be working as a team. Teams work together because they can work more quickly and brainstorm ideas. The steps for producing an advertisement are as follows:

Step 1
Decide on a product that you want to advertise or one that has been given to you by your teacher.

Step 2
Listen to some radio advertisements as part of your homework assignment. Listen to how the advertisements are presented. Were they single announcer? A jingle? Two announcer advertisements? How long were they?

Step 3
Discuss the ads that you heard on the radio with your team members. Make notes on the techniques that were used.

Step 4
Using a computer and word processing software, make a list of product features that your team is advertising. Discuss these features as a team. Check-off the features that are important to your advertisement.

Step 5
Using a computer and word processor begin writing your advertising copy. A 60-second commercial should have about 125 words. Spelling and punctuation are important in writing. Use a dictionary to check your spelling and word usage. When writing advertising copy you should double-space your sentences to make it easier to read. You will probably make several drafts of your copy. Don't worry about that. It is part of writing excellent advertising copy just like the advertising agencies do!

Step 6
After your team has decided upon the best advertising copy you are ready to record your ad. Use a tape recorder to record your script. One person should be the producer and the other two should be announcers. Teamwork is very important in writing and recording a radio script. You will probably need to do it several times because someone may sneeze in the middle of the recording session!

Step 7
Evaluation. Make a check list for each of the class members about the features of your advertisement. These features should include the make of the product, its price, where it can be purchased, and the advantages of the product or service. Did the advertisement attract the attention of the listeners? Was the advertisement interesting? Play your radio advertisement for the class. Then pass out a copy of the check list to see how many of your class members can remember the name of your product, where they can get it, and how much it costs.

Step 8
Summary. Writing can be fun! There are many kinds of careers where writing is a major part of a person's job. Advertising copywriting is but one. Men and women write stories as reporters for newspapers and magazines. Television programs require the work of many kinds of writers. There are authors of books and short stories. Visit your library to learn about careers in writing and journalism.

Continued from page 4

Notes and Investigations

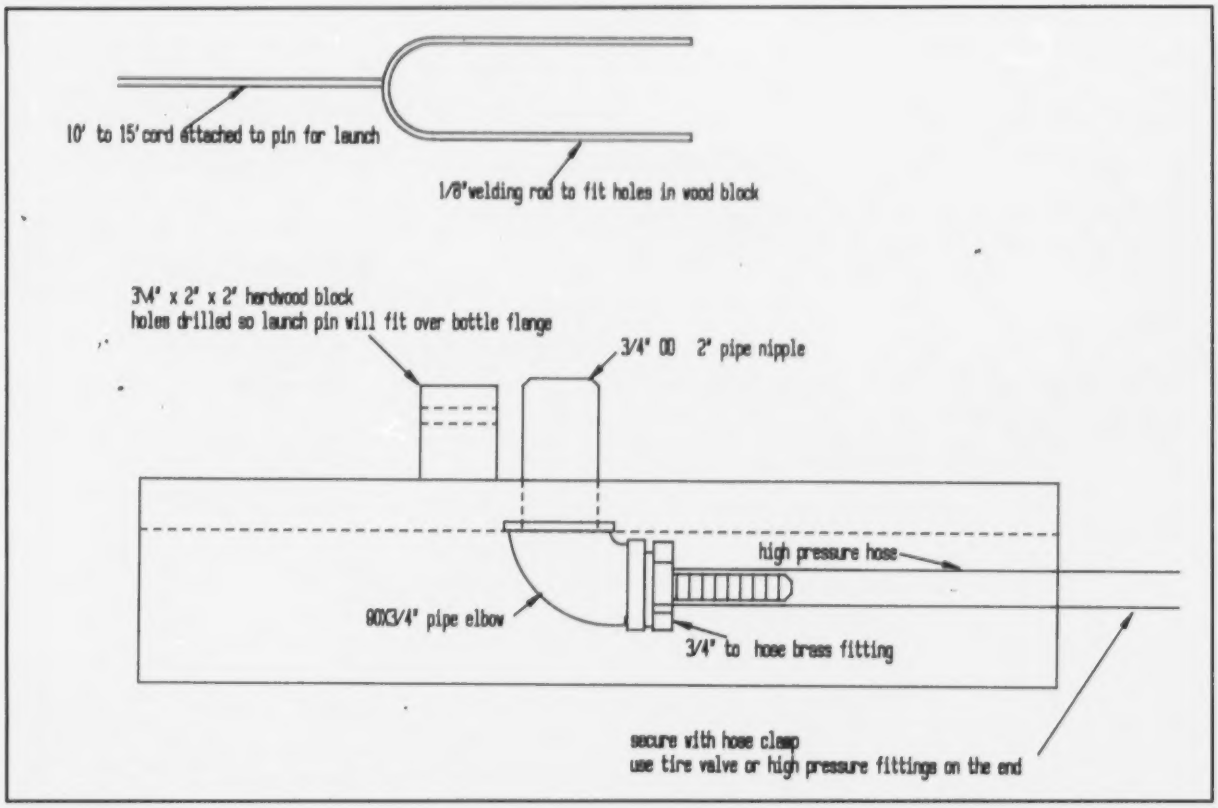
Visit your school library for information about advertising layout and design. Critique ads from newspapers, magazines, and other media.

Evaluation (includes feedback)

1. Describe the purpose of advertising.
2. Assess the impact that advertising has on consumers in making purchases.
3. What techniques or technologies did your group use to prepare your ad? What alternative processes could have been used?
4. Does your ad apply good design and layout principles?
5. Does your advertising copy demonstrate clear and effective writing style?
6. Will your ad attract the interest of consumers?

Building A Bottle Rocket

Fred Hadley


10' to 15' cord attached to pin for launch
1/8" welding rod to fit holes in wood block
3/4" x 2" x 2" hardwood block
holes drilled so launch pin will fit over bottle flange
3/4" OD 2" pipe nipple
high pressure hose
90X3/4" pipe elbow
3/4" to hose brass fitting
secure with hose clamp
use tire valve or high pressure fittings on the end

Context

The action reaction principle provides the basis for all transportation systems. Propulsion, guidance and recovery systems are involved in all manned space flights. The abilities of countries and corporations to launch and recover vehicles is dependent on their understanding and application of technology.

Objectives

Demonstrate problem solving skills.
Define the action reaction principle.
Construct and launch the rocket described in the challenge.
Demonstrate effective writing skills.
Apply math and science skills to the solution of technological problems.

Materials and Equipment

2-liter soda bottle, air compressor, water, raw egg, (Others identified by students.)

Challenge

Working in a group of two or three students, design and construct a launching pad and rocket with a recovery system.

Using water and compressed air, launch the rocket, using a raw egg for a payload. Recover the payload intact. Use ground based triangulation to determine the rocket's highest altitude.

Limitations

Design must be economical.

Notes and Investigations

Attach sketches, drawings, additional information, etc.

Evaluation of your solution to the challenge will be based on your returning the egg to the instructor intact.

Evaluation (includes feedback)

After the recovery of your rocket, respond to the following:

1. What are the two forces that must be overcome in order to place the egg as high as possible into space?

2. Describe the action reaction principle and how it relates to the operation of your rocket.

3. Prepare a written report on different methods of recovery investigated by your team.

Site Selection for Business and Industry

Walter F. Deal, III

Context

Selecting a site for a business or industry is an important step for managers and investors. Companies and corporations of all sizes carefully study locations for a potential home for their business. Major multi-national corporations such Nissan, Mazda, Sony, and Canon have located assembly plants in Tennessee, Kentucky, California, and Virginia. There are many other local, regional, and national business that are faced with a decision to select a site annually. Three major considerations for multi-national companies locating their facilities in another country are closeness to the market, transportation, and tax advantages.

There are many other factors that companies must consider in selecting a site. Some of these factors include transportation resources, materials, trained workers and educational institutions, population growth, access to markets, annual income and wage rates, available land, utilities, natural resources, environment, tax and other financial incentives, and nearby associated industries. Each of these factors contribute to a decision to locate in a given area.

Objectives

1. Demonstrate problem solving skills.
2. Use information technology to select an industrial site.
3. Demonstrate cooperative learning and teamwork in selecting an industrial site.
4. Demonstrate effective writing skills in preparing a technical report.
5. Describe the importance of industrial development commissions in attracting new businesses and industries to a locality.

Materials & Equipment

World Almanac, personal computer, PC Globe© or PC USA©, company annual reports, state industrial development guide, and site selection check list.

Challenge

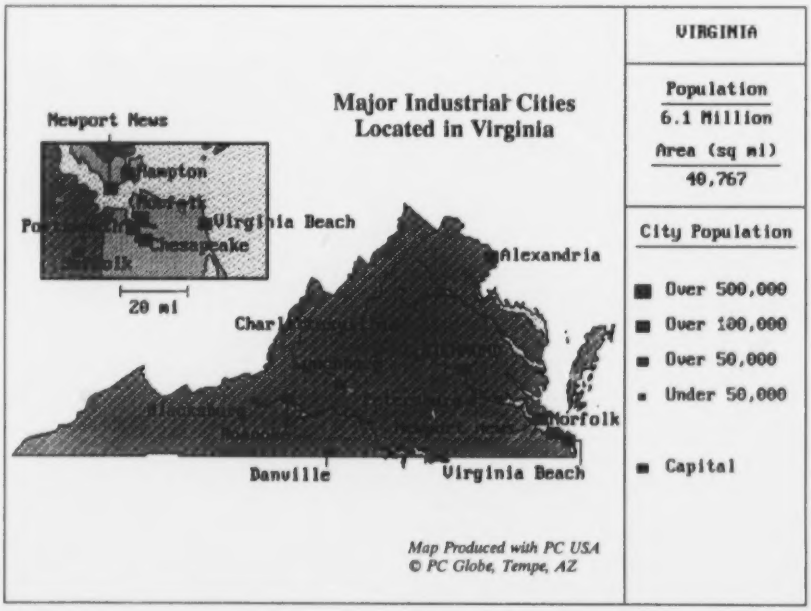
The economic growth and health of a locality depend on employment of its citizens by business and industry. Companies may be classified as retail and wholesale, communication, construction or manufacturing. Each of these business categories have general and specific needs for locations and available source of trained workers.

Conduct a review of your region or locality as a potential location for a national or multi-national company. The class should identify the types of businesses and industries that would be attractive to your area. Your class should be divided into groups. Each group should be responsible for identifying a company that could be located in your state or locality. Groups may be instructed to work with companies representing a specific industry such as communications, retail or wholesale, manufacturing, or construction.

Contact or request a representative visit from your local or state industrial development commission for information about incentives available to companies for locating in your area. Prepare a check list of advantages and benefits of your area that would be attractive to a company. Each group should write a report on its recommendations for a company site location. A land map should be prepared showing the site where the company should locate. Present your report to the class.

Evaluation (includes feedback):

1. Each group is to prepare and present a report to the class.
2. Determine whether the major factors for site selection been met.
3. Does a selected industry have any negative or controversial issues that must be resolved (i.e. chemical usage, toxic wastes, increased traffic, etc.)
4. Are there any resources for a selected business or industry that must be developed to make the locality attractive?



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Bar Coding

Submitted by Beth Bulcher-Willner

Context

Bar coding is among the automatic identification systems that is taking the world by storm. Students need to know the applications of bar coding and how it works.

Objectives

As a result of the activity, students will be able to:
Identify applications of bar coding.
Identify different bar code symbologies.
Demonstrate the procedure for making a bar code.
Define the parts of a bar code.

Materials & Resources

Code 39 or UPC code configuration

Basic bar layout for code's X dimension

Optional: Computer
Wedge wand: Worthington Data Solutions Santa Cruz, CA (1-800-345-4220) TPS Electronics Palo Alto, CA (1-800-526-5920)

Tasks/Limitations

Students are to make a collection of at least six bar code symbols containing at least three different symbologies. A paragraph should accompany each symbol explaining where and how it was used. Make sure the student only collects the portion of the product that has the symbol and name of the product.

Given the code configuration and the bar layout, students should fill in the appropriate spaces to make a bar code with their initials, name, or student identification number. They are to label the characters that make up the bar code. This worksheet should be attached to their collection. (Optional: with the wand hooked up between the keyboard and the computer, have the students check their bar code by scanning it with the wand.)

Evaluation

The collection should be evaluated based on completion of the tasks/limitations stated above. Presentation and spelling should be considered.

The Green Revolution in Transportation

Walter F. Deal, III

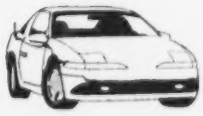
Context

The automobile offers people in the developed world and many other nations in the world the opportunity for personalized mobility and travel that is unprecedented in history. The economies of many nations though out the world depend to some degree on the automobile, through its manufacture, production of components and accessories, construction of highways, petroleum products, and businesses that serve customers on-the-go, i.e. motels, cellular telephones, and etc. Automobile dealers, banks and credit companies, garages, and fast food restaurants are dependent on people buying and using automobiles as potential customers for their goods and services. Automobiles have truly made for mobile societies.

For all of the benefits that the automobile brings to individuals, society, and the economy there are some major penalties. Nearly all production automobiles used on the highways are fueled by gasoline or diesel fuel. Using petroleum as a fuel for automobiles produces large quantities of pollution in the atmosphere. Even though automobile manufacturers have improved the efficiency, economy, and emissions of automobiles through research and government regulation, automobile emissions continue to be a problem. The automobile may soon be a real part of the green revolution in cleaning-up and reshaping the environment.

Los Angeles well-known for its poor air quality and smog, enacted regulations through its South Coast Air Quality Management District in 1989 to improve the air quality in the Los Angeles Basin. Automobiles are not the only targets for reducing pollution. Oil refineries, manufacturers, power companies, and many other potential areas are covered under these regulations. Alternate energy resources are needed to power automobile of the future in the Los Angeles area to meet the stringent pollution control requirements.

Enviromobile - Revolution in Transportation



Features

Low-profile
Low Coefficient of Drag
Aerodynamic Design
Zero Emissions
All Electric Drive
Comprehensive Safety Features
Three-year Battery Life
High-reliability

Objectives

1. Demonstrate problem solving skills.
2. Apply critical thinking skills to design an alternative fueled vehicle.
3. Demonstrate cooperative learning and teamwork in designing and constructing a model alternative fueled vehicle.
4. Demonstrate effective writing skills in preparing a technical report.
5. Assess the impact of alternative fueled vehicles on the environment and society.

Materials & Equipment

Modelling supplies, sheet vinyl, plastic wheels, steel rod for axles, battery holder, AA NiCad battery, 1.5–3 volt DC motor, 26 or 28 GA stranded wire, LEDs, balsa, glue, and other instructor identified materials available.

Challenge

Identify three-member design teams to research, design and construct a model of a two-passenger personal transportation vehicle that has zero or minimal pollution emissions. Prepare a report on the design concept, type of propulsion, re-fueling requirements, estimated speed and range, and safety considerations.

Evaluation (includes feedback):

1. Each group is to prepare and present a report to the class.
2. Demonstrate that the model transportation vehicle is operational.
3. Describe how the vehicle design will minimize polluting emissions.
4. State how the vehicle design will affect existing transportation systems and users of the new vehicle designs. *(wfd)*

Resource Recovery

Fred Hadley

Individual consumers who help the nation to recycle its resources frequently earn money doing so. Reynolds Aluminum Co. has paid out millions of dollars in recycling efforts, both to consumers and in upgrading its processing operations. (Photo by Fred Hadley)

Context

Products that have outlived their usefulness can often be used to make other products. Simply throwing them away is wasteful.

Objectives

Demonstrate creativity

Demonstrate problem solving skills

Design and construct a useful product

Apply math and science skills to the solution of technological problems

Materials and Equipment

An expended product suitable to your design (Others identified by students)

Challenge

Working with another student, design and construct a useful product from one that would usually be thrown away (example: use an old tire to make beach sandals or a plastic bottle to make a bird feeder). Be creative. See which team in your class can come up with the best idea. Have them explain why that idea is the best.

Limitations

You cannot use the either of the two examples given above. Your constructed product must function properly. You cannot make a model and 'pretend' it works.

References

See the Resources in Technology article entitled Resource Recovery on page 17 of this issue.

M/S/T Interface

According to Wheelabrator Frye Technologies, Inc., different sources contribute to our continuous solid waste stream. These are:

Food and yard waste	29.0%
Glass	8.4%
Metals	8.9%
Paper and cardboard	35.6%
Plastic	7.3%
Other	10.8%

Why do you think food and yard waste comprise nearly 30% of the solid waste stream? Can you think of any way to lower the consumption of paper products in your own home?

Using the percentages given, construct a bar graph or pie chart to graphically represent message these figures tell. You may choose to create a more innovative chart as long as the correct message is conveyed.

Walking Fingers—The Yellow Pages

Walter F. Deal, III

Context

Advertising plays an important role in the promotion and sales of goods and services. Over $100 billion is spent annually on American advertising. Advertising strategies include a wide variety of media. Some of the media used for advertising include radio, television, newspapers, magazines, outdoor, and other forms. One category of advertising often overlook because it is not like the colorful, glossy ads in magazines is the telephone directories or yellow pages. You may have often heard the phrase "let your fingers do the walking"™. The yellow pages serve a very special market. The yellow pages are a listing of advertisers that offer goods and services to potential customers that have a need to make a purchase. People that use the yellow pages know what they want and are looking for a place to buy.

Video Productions
Turnkey Production Capabilities
Complete Shooting and Editing Facilities
Studio Production in 40' X 60' Sound Stage
Post Production in 3/4", One inch, Betacam
Large Prop Inventory
880-1000 Video Productions Inc.

While yellow page advertisements look very similar, yellow page directory publishers offer a variety of sizes and formats. Listings may be a single line or a half-page or more. Advertisers deciding on the best format can be faced with some tough decisions. Frequently advertisers will look at competitor ads and decide to make their ads prominent (roughly the same size as competitors) or dominant (larger than competitor ads). A yellow page ad should be designed from the reader's point view. For example, a reader looking for computers, television repair, bicycles, or sports equipment will look under those headings to find the right company. Thus, it is important to emphasize "what," "who," the telephone number, and "where." Other information such as brand names, locations, hours of operation, special licenses may be included. Graphics included in an ad help the reader identify a company more readily.

Yellow page directory advertisements should be attractive, easy to read, and standout from the competition. A single bold type face should attract the reader to your ad that advertises the goods or services. A bold type face should emphasize the advertiser's phone number. Use only two type faces. Balance, white (yellow) space, and unity are design principles that should guide the preparation of an ad layout.

Objectives

1. Demonstrate creative design skills.
2. Use computer technology to produce a communication product.
3. Demonstrate cooperative learning and teamwork in designing a yellow page advertisement.
4. Apply research skills in analyzing advertising designs and layouts.
5. Demonstrate effective writing skills in preparing a technical report.

Materials & Equipment

Yellow page directory, paper, pencils, layout tools, clip art, rub-on letters or computer with graphics software, electronic clip art, and printer (scanner optional).

Challenge

Identify and select an advertiser category such as bicycle repair or sporting goods and prepare a quarter-page advertisement for a yellow page directory. Using a design team approach, each team should design and prepare yellow page ads for the same category. Contact and invite a local merchant or advertiser to critique the appearance and quality of the team-developed ads.

Evaluation (includes feedback):

1. Each design team is to prepare and present their completed ad layout to the class.
2. Describe the layout techniques used to produce the team-developed layout.
3. Describe how the yellow page advertisements differ from other advertising media.
4. State how users of the yellow pages differ from potential customers of other advertising media. *(wfd)*

Adventures in Technology

Walter F. Deal, III

Context

Microprocessors, integrated circuits, and transistors have paved the way for the electronics revolution in communications, computation, and personal entertainment devices. Personal computers, portable tape players, miniature FM stereo radios, and video games are just a few examples of products that we use every day.

The video game market represents a multi-million dollar business world-wide. The design, manufacture, marketing and distribution of video games requires electronic engineers, product and game designers, software programmers, technical support people, and marketing channels. Video game products include wrist game devices and hand-held models with LCD displays as well as the latest hologram technology arcade machines. Other models are designed to operate with color televisions and use 16 and 32-bit computer technology.

Video game technology integrates sound, color, animation, and holographic effects to produce entertaining and educational products. Game designers are continuously researching and applying new technologies to produce innovative entertainment products for new generations of video game players.

Objectives

Apply creative thinking skills to produce a product design.

Demonstrate problem solving skills. Use ergonomic principles to design innovative hi-tech products.

Use tools, materials, and processes to construct an presentation model.

Apply math and science skills to solve technological problems.

Materials and Equipment

Styrofoam blocks, foam-core board, dry-transfer letters, adhesives, vinyl or acetate film, acrylic paints, colored markers, miscellaneous hardware, computer and peripherals, word processor, and CAD or drawing software.

Challenge

Divide the technology class into teams and apply the technological method to design and construct mock-ups of action-oriented video game devices. Construct simulated input devices such as joysticks, trackballs, buttons, switches, or voice activated operation to control the game system. Novel glove or helmet devices also should be considered. Simulated display devices may be monochrome or color LCDs or 12 to 18 inch video monitors. Review various product literature and advertisements from companies such as Sega, Nintendo, Atari, etc for design ideas.

Limitations

The design theme should focus on adventures in technology and its impacts. The model can be a hand-held device, table model, or floor-type arcade design.

Notes and Investigations

Plan, design, and construct video game mock-ups and prepare technical reports on the designs. Screen simulations and a story board should be used to add realism to game designs. Identify a guest panel of expert game players or an engineer to review and evaluate team models and presentations.

Resources and References Used

(Information obtained by students)

Evaluation (includes feedback)

Completeness of the product mock-up (sketches, drawings, model, technical report, screen simulations, and presentation). Appropriateness of the game theme to technology and marketability of the product. Application of scientific, mathematical, and ergonomic principles. Application of technical writing skills in preparing the project report. *(wfd)*

The Trip Home

Walter F. Deal, III

Context

There are many projections and forecasts by engineers and scientists at NASA. Futurists at universities and research institutions are projecting that people from the planet Earth will be travelling and inhabiting planets in our solar system in the near future. The National Space and Aeronautics Administration's Space Station Freedom will provide a platform for engineers and scientists to perform long-term operation, research, and experimentation.

There are a limited number of shuttles available to carry cargo and humans back and forth to the Space Station Freedom to support operations on-board. NASA engineers and scientists are studying dedicated personnel vehicles that can reduce the burden on the Space Shuttles. There are design teams working at NASA Langley and the Johnson Space Centers. These dedicated personnel vehicles may become the commuter vehicles for space travel in the not too distant future!

Objectives

Demonstrate problem solving skills.

Use ergonomic principles to accommodate human needs in extended travel.

Design a dedicate personnel vehicle capable of carrying four persons and limited cargo.

Apply math and science skills to solve technological problems. Demonstrate effective writing skills.

Materials and Equipment

Balsa, foam-core board, styrofoam blocks, fabric, adhesives, vinyl or acetate film, acrylic paints, miscellaneous hardware, computer, word processor, and CAD or drawing software.

Challenge

Design a dedicated personnel vehicle model that is capable of being rocket-launched, complete its mission in low-earth orbit, fly back to earth on its own, and land at a major space vehicle landing zone. The vehicle must be capable of carrying four persons and include provisions for a small cargo load. Design options may include winged gliders, conical capsules, or shuttle-like designs.

Limitations

The design must be economical, reliable, and reusable. Additionally, the design must include facilities for docking with the Freedom Space Station and transferring its occupants and cargo.

Notes and Investigations

Visit your school library to review the NASA Freedom Space Station concept. Research the principles of ergonomic or human engineering. Review the principles and requirements of rocketry and flight. Plan, design, and construct a dedicated personnel vehicle and prepare a technical report on the design. Invite a guest engineer to review and evaluate presentations.

Resources and References Used

(Information obtained by students)

Evaluation (includes feedback)

Completeness of the research project (sketches, drawings, model, technical report, and presentation). Application of scientific and mathematical principles. Application of technical writing skills in preparing the project report. *(wfd)*

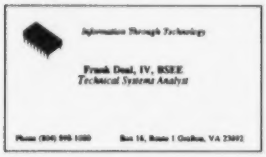
The Business Card

Walter F. Deal, III

Context

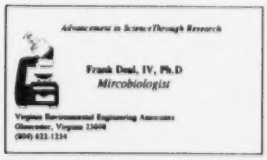
Many people in business, industry, and education have personal calling cards that are commonly called business cards. These little cards, generally measuring 2" × 3½" contain a wealth of information about an individual and his or her associations. A person's name, title or position, phone number, company address and affiliation, as well as a corporate logo may appear on business cards. They are used for introductions and in some cases are a form of advertising.

Business cards may include a wide variety of graphic layout techniques. They may be designed very conservatively with just a name and address or they may include corporate logos or other graphics represent a company or person's interests. Business cards are usually printed on index or cover stock with a variety of finishes and types of papers. Business cards may be even printed on plastics or metals. A variety of paper and ink colors may be used to enhance the appeal of a business card. Additionally, photographs, holographic images, or clip art may be used as part of the card design.

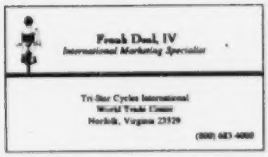


Business cards, like letters of introduction in colonial times, have become part of our culture and are used to get to know someone or introducing one's self professionally. Frequently, business cards are kept in special cases in one's pocket or purse, or on a desk in an attractive tray. Frequently people that travel to other countries may have one side of their card printed in English while the reverse side may be printed in the language of the country being visited.

In some eastern cultures, such as China or Japan, the presentation of one's business card is a very special event. The owner of a card should present his or her card to the another person so that they could read and examine the card. The recipient of the card would carefully view the card and ask questions about the owner's position, company, or logo. Accordingly, in exchanging cards with someone from another culture it would be a matter of politeness and the recipient would be expected to do the same. It would be an insult to receive someone's card and merely "stuff it" in a pocket!



Challenge



Visit your school library and research a career specialty or area that interests you. Research the career requirements, special training or educational requirements, salary ranges, and opportunities for a job of your interest. Apply planning and design skills to create an appropriate business card that represents your career choice. You may wish to print copies of your business card with a computer printer or other printing technologies.

Resources and References Used

(Materials used in completing this activity.)

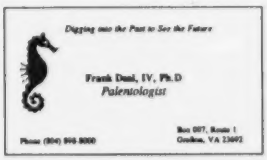
Objectives

1. Demonstrate creative design skills.

2. Apply good design principles in preparing thumbnail and rough sketches and a mechanical layout.

3. Use drawing and computer tools to design and print a business card.

4. Use the school library to research career opportunities, qualifications, education and training requirements, working conditions, and salary ranges for the career of your choice.



Materials & Equipment

Sketching pad, pencils, erasers, colored markers, and clip art, or computer, printer, and graphics software.

Evaluation (includes feedback)

1. You are required to present your completed business card design and an overview of your career choice to the class.

2. Describe the job outlook for the your career choice.

3. Describe the features of your business card and the graphic techniques used to produce it. *(wfd)*

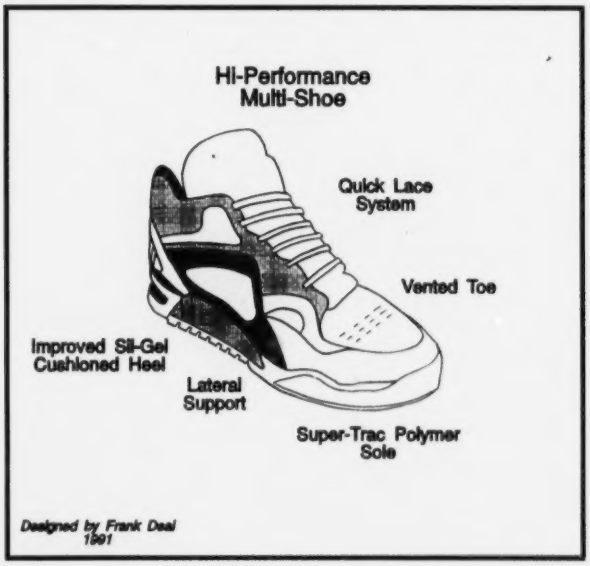
Does the Shoe Fit?

Walter F. Deal, III

Context

A visit to a local shopping mall will reveal that footwear is a multi-billion dollar global industry. While traditional shoes made of leather, polymers, fabrics, and other materials to continue to maintain a market share of the footwear business, sport shoes have made dramatic impacts on style, performance, and design. Brand names such as Reebok, Nike, Addidas, ASIC, L.A. Gear, and British Knights are some of the major players in the sport shoe industry. The two largest sport shoe companies are Nike and Reebok. Each of these companies have over $20 billion in sales annually. While these two United States-based companies market a large volume of footwear designs, they are manufactured by over-seas companies under contract. For example, materials may be shipped from the United States, Australia, and Canada to Korea or another country for assembly into footwear designs created by one of the major sport shoe companies.

The US-based companies specialize in creating sports shoe designs, marketing, and distribution of those products. There are at least twenty sport shoe designs available at many stores that sell sport shoes. These design categories include sport shoes specifically designed for volley ball, football, casual wear, hiking, running, soccer, tennis, cross-training, aerobics, golf, and other activities. Sport shoes are ergonomically designed and may be enhanced with air cells or gel inserts and special pump-up air bladders or bags to provide unique fit and performance qualities. Sports shoes in these categories are called high-performance designs. Each season, new designs are engineered and introduced with aggressive advertising campaigns.



Challenge

Successful sports shoe companies rely on high-quality designs and manufacture of sport shoes that are marketed with very aggressive advertising campaigns. Sports shoes are designed with high-performance and style as the guiding objectives. Designers and human factors engineers work together in creating and crafting shoes that meet the needs and expectations of consumers.

The class should be divided in to design teams with the responsibility to research the current market for sports shoes and design a superior competitive product. Research factors should include specific sports shoe categories, features, materials, pricing, and style.

Objectives

1. Demonstrate creative design skills.

2. Use drawing and computer tools to design and engineer a product.

3. Demonstrate cooperative learning and teamwork in designing a high performance consumer product.

4. Apply market research strategies in identifying consumer needs.

5. Demonstrate effective writing skills in preparing and presenting a technical presentation.

Resources

(Materials used in completing this activity.)

Materials & Equipment

Sketching pad, pencils, erasers, colored markers, air brush, illustration board, assorted air brush inks, computer and graphics software.

Evaluation

1. Each design team is to prepare and present their completed sports shoe design to the class.

2. Describe the features and recommended materials for the sports shoe design.

3. Describe how each team's product design may be superior to the competition. *(wfd)*

Writing Dynamic Learning Activities

John M. Ritz, D T E and Walter F. Deal, III

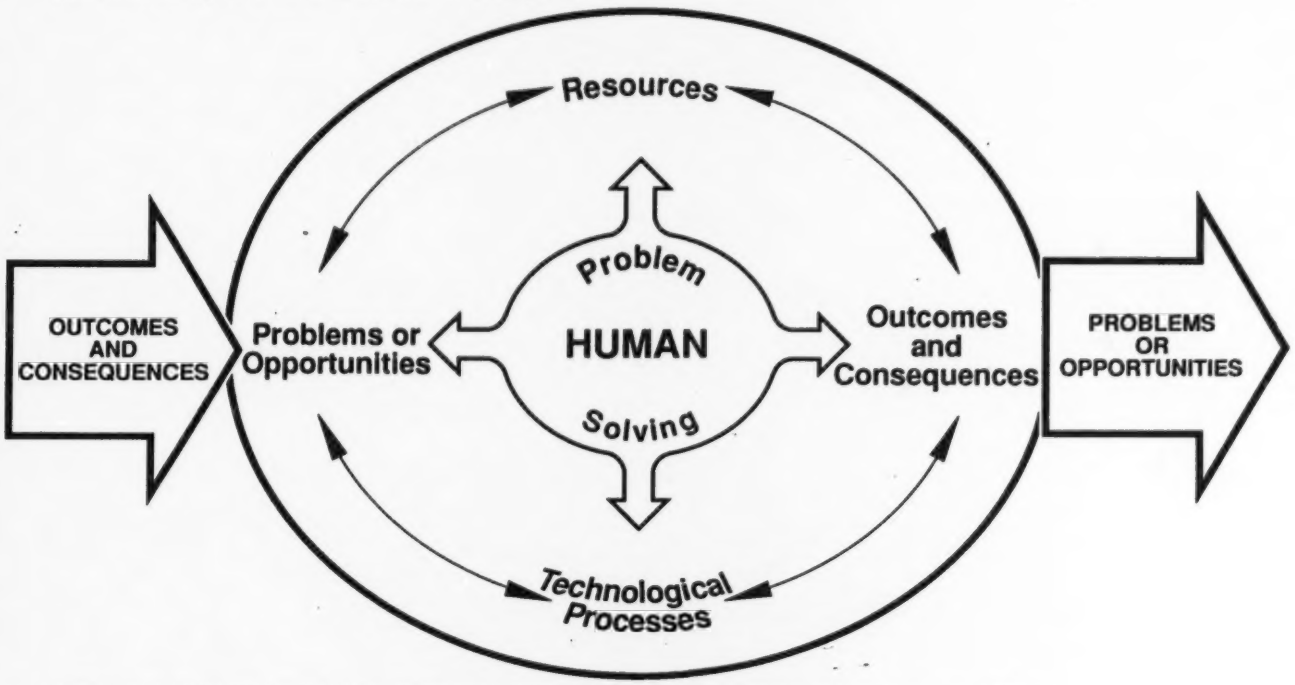


Figure 1 The Technological Method Model. Excerpt from A Conceptual Framework for Technology Education. *Savage and Sterry (1990) p.13.*

Design briefs are instructional tools used to stimulate creativity, critical thinking and problem solving abilities of technology education students. However, prior to exposing students to the design brief instructional methodology, it is important that teachers teach and provide guided experiences through the problem-solving technique and technological method. Figures 1 and 2 illustrate the problem solving loop and the technological method to aid you in this process.

With a knowledge of problem solving and the technological method, students can now progress through design solutions to realistic technological problems with some background knowledge. Following is a convenient way of presenting technological problems to students through the design brief format. This format is a proven way of structuring dynamic educational experiences that stimulate creative thinking and aid in the development of problem solving skills. Each design brief should include a context, challenge, objectives, resources, materials and equipment and evaluation.

The Context. This section of the design brief outlines the problem and provides a realistic background for the problem. It should provide stimulating information to "grab" the student's interest and have them want to pursue research and application in a specific technological and/or quality of life area. The term rationale might be another word used to describe the context from which the design problem will arise. It may focus on environmental quality, job satisfaction, mobility, leisure activities or various other quality of life factors.

The Challenge. This is section of the design brief provides for the establishment of the design problem. Here you should provide enough information to give your students direction but not the answer to the problem. The challenge should delineate the problem of the design brief. Examples could be to produce an advertisement for a new CD or design a gift product for Mother's Day. The challenge sets the parameters for the design brief problem.

(continued)

A word about objectives. These are the outcomes that the students should experience as they complete the design problem. Remember that students should be developing cognitive, psychomotor and affective knowledge related to a study of technology. You should have more than one objective for each design brief. Examples may include: apply the problem solving method, experience the technological method, produce dynamic graphic layouts, construct prototypes, etc.

Resources for the problem solving activity. These are the basic materials that are needed as references while students attempt to solve the design problem. List only those that are needed to introduce the design area. If you would like the student to include or study any particular knowledge, i.e. composite materials, reference an article here. Also provide space where students can list references they found to assist them in their research.

A materials and equipment list provides direction. Here you can provide further reference to materials tools that students should use in "tackling" the research problem. Do you want them to use certain materials and tools? Is the lab wide open for their use? Do you want your students to focus on using particular materials to solve the problem?

Evaluation. This is where you place the criteria for judging the success of their design solution. Who will judge their efforts? Is there a weight limit to their design? Should the solution include a written report or technical presentation? Should the prototype of their design function? In the evaluation section, you establish how student's solutions will be assessed.

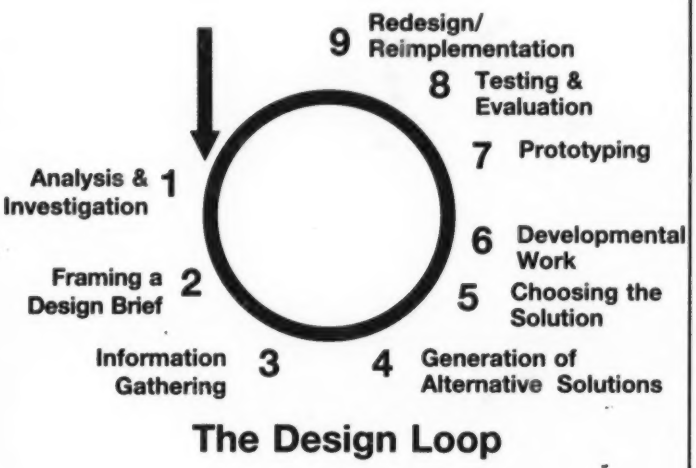


Figure 2 The Design Loop. Excerpt from "The Teaching and Learning Environment." The Technology Teacher. *Todd (1990) 50(3) p.5.*

Try it! A sample design brief is shown to illustrate the a simple technique that can be used to teaching problem solving and critical thinking skills. We hope that this design brief process will assist you in developing your technology education programs. If you develop some successful design briefs, send them to *The Technology Teacher*, International Technology Education Association, 1914 Association Drive, Reston, VA 22091.

Sample Design Brief: Communication Design— Olympic Beverages

Resources

Naisbitt, John. Megatrends 2000: ten new directions for the 1990's New York: Morrow, 1990.

Materials and Equipment

Transfer letters or graphic computer programs. Screen printing supplies, card stock or other paper mediums.

Context

The summer Olympics will be held in Barcelona, Spain, this year. Athletes and spectators from over 150 countries will be attending these events. To satisfy the thirsts of those in attendance, numerous beverages will be needed. Athletes from tropical areas prefer fruit drinks as compared to carbonated beverages. In addition, those in attendance will be from various cultures and speak numerous different languages. To make the athletes feel relaxed and not upset their dietary systems, it is important that the Olympic Committee cater to their needs.

Challenge

Design a beverage container for supplying Olympic athletes and spectators with fresh juices. Keep in mind that the container should be convenient for suppliers and groundskeepers, and should address the cultural needs of those in attendance.

Objectives

1. Apply the problem solving method.
2. Utilize the technological method.
3. Produce prototypes of products.
4. Apply graphic techniques to enhance a product design.

Evaluation

1. All containers must be 473 *ml.*
2. Consideration should be given to shipping requirements.
3. Consideration should be given to disposal requirements.
4. Select students from your school's foreign language classes to judge the best design solution.

Technology is Building in the First Grade

Cindy Etchison
Toni Farthing

Objective

To develop an awareness that technology is building and that building uses a variety of materials.

Background

Students have had a variety of experience building with wooden blocks, unifix cubes, pattern blocks, and notched-out foam hexagon pieces. They have experimented with these things during Explore Time. Explore Time is a part of the day when students freely "explore" different things about the room. They may visit the class library, put together a puzzle, build a structure with blocks or unifix cubes, make math sentences with colored links, or a variety of other activities.

To add a technology twist to Explore Time, a bi-monthly technology challenge is posted in the block area. The challenges are written so they can be read independently. If partners choose this option during explore time, they read and implement the challenge using whatever materials are listed. After working together for five to eight minutes, the partners go and get the next pair of partners to try the challenge. The pair that has just finished building will explain to the next two what they did, and discuss any problems that occurred and how they solved them.

Procedure

An illustrated Flow Chart of how to make a peanut butter and jelly sandwich in the form of a bulletin board provides the start to an interesting class discussion. After the students observe the board for a few days, the interpretation begins. To "build" the sandwich correctly we need to follow certain steps using certain materials. Students can role play how to make a peanut butter and jelly sandwich. This is a good kickoff to use to explain that we can build many other things just like we build sandwiches, and that a variety of materials can be used.

Post, in the wooden block center, a partner challenge every two to three weeks. With a partner, construct a building as suggested by the challenge card posted. Together read the challenge and the safety rules. Examples of challenges follow.

Challenge 1: Build the tallest building you and your partner can, using three different kinds of wooden block shapes, that can stand freely.

Challenge 2: Build a building that holds the most books.

You may use as many blocks of as many shapes you'd like.

Challenge 3: Build a building that remains standing on a slanted surface.

These building challenges can easily be expanded by varying the materials used for building. Using drinking straws, toothpicks, popsicle sticks, or other items will also allow for creative exploration.

Summary

Students begin to use vocabulary that describes basic construction techniques. They use the problem solving approach to make choices and decide on an appropriate solution. They have applied math concepts (measuring, weight, balance, and shapes) in order to meet the challenge. They use their creativity to apply to real life problems such as the need for a dog house, storage for bikes, and toys.

Sound, Sensors & Logic

Walter F. Deal, III

Context

Every year thousands of people are injured or killed by fires in buildings and homes. Local, state, and national building codes are designed to help ensure that the health and safety of all individuals are protected during the construction of buildings and structures. Fire extinguishers, sprinkler systems, and fire alarms are used to protect inhabitants in the event of a fire emergency. Following good safety practices in storing and using flammable materials can help reduce the risk of fires. However, in the event of a fire condition in a structure, the earliest possible warning and evacuation significantly reduces the risk of injury.

Fire and smoke sensing systems include mechanical and chemical sensors as well as electronic systems. All homes should include at least one smoke or fire alarm that has the capability to sense heat, smoke, or combustible gases. Generally, heat detectors have thermal sensors that detect abnormally high temperatures. Smoke detectors may use optical sensors that detect smoke. While more sophisticated sensors use a radiation chamber to detect combustible gases during the pre-ignition phase of a fire situation. some detectors use a combination of sensors to provide a broader degree of protection.

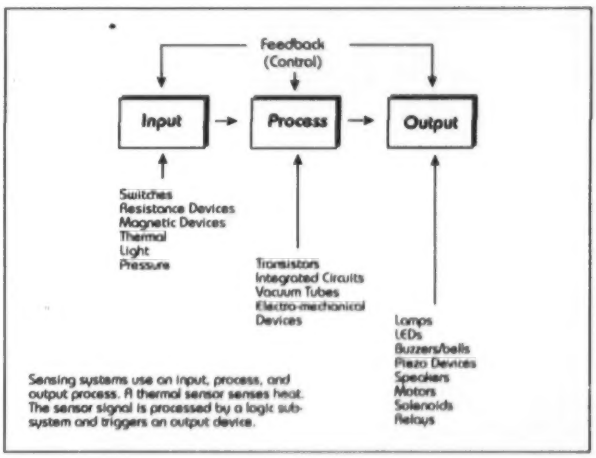
Sensors, logic circuits, and output devices can be used to detect and make decisions, and announce certain environmental conditions. The concept of input (sensor), logic circuits (process), and output (buzzer or other audible device) provides an insight into how alarm systems operate. Thermistors and photo devices can be used to detect heat and light. Basic logic circuits such as OR gates and AND gates can be used for processing signals detected by sensors. Output devices such as piezo buzzer, lamps, and light emmitting diodes (LED) can be used as annunciators or warning devices.

Challenge

The type of fire or smoke detector and its location are important considerations in providing an early fire warning condition. Residential and commercial structures have unique needs and building codes designed to provide protection to their occupants and contents. Your challenge is to identify sensors that can be used to detect heat and or smoke which are several indicators of a fire condition. Design and fabricate a simple smoke and or fire detector using electronic components and describe appropriate locations for the placement of detector systems.

Objectives

1. Demonstrate problem solving skills.
2. Use electrical/electronic technologies to provide and audible and visual warning of potential fire conditions.



Sensing systems use an input, process, and output process. A thermal sensor senses heat. The sensor signal is processed by a logic sub-system and triggers an output device.

3. Demonstrate cooperative learning and teamwork in designing a technological system.
4. Demonstrate effective writing skills in preparing and presenting a technical presentation.
5. Demonstrate skill in designing and constructing a package design for a fire or smoke detector.

Resources

(Materials used in completing this activity.)

Materials

Sketching pad, pencils, erasers, colored markers, illustration board, foam core board, and miscellaneous material. Electronic components eg. thermistors, phototransistor, relay, piezo buzzer, lamp/LED, AND gate, OR gate, battery, or a commerical electronics experimenter.

Evaluation

1. Each team is to design and construct a fire detector.
2. Prepare a presentation sketch or drawing for a fire detector package design.
3. Describe the features and recommended materials for the fire detector design.
4. Describe how the concept of input, process, and output apply to your team's fire detector design.
5. Describe the location and placement of fire detector systems for residential structures.
6. Describe how each team's product design may be superior to the competition. *(wfd)*

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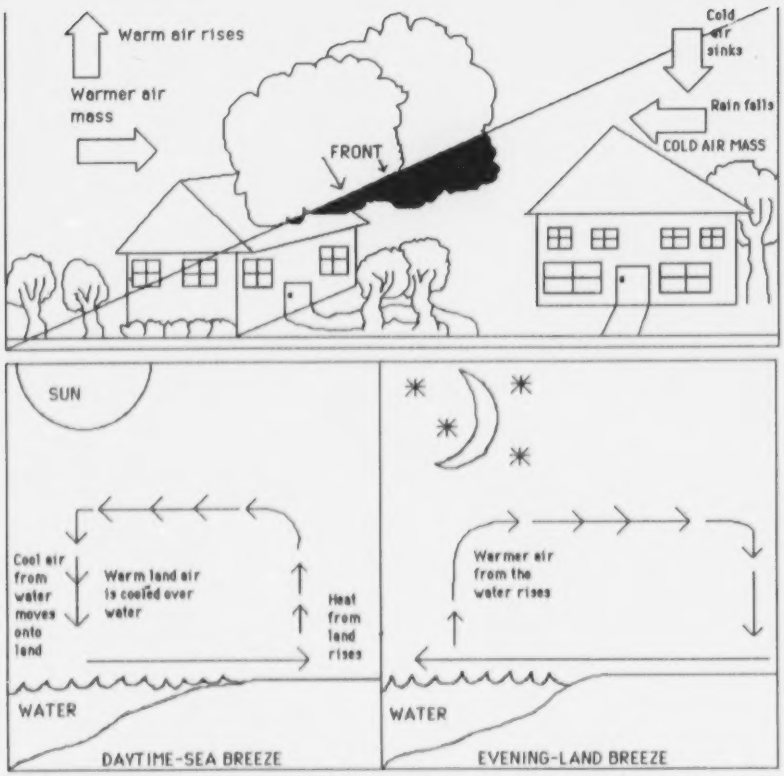
Weather Forecast

K. George Skena



Weather fronts bring rapid changes in wind and weather conditions. Most notable are "cold fronts" that usher in rapid changes in air temperatures and turbulent winds. The figure above shows how surface waters and day and night-time temperatures affect winds or breezes. (Courtesy of National Oceanic and Atmospheric Administration).

Design Brief

Weather and the Sky

How does a change in weather affect the color of the sky?

Context

Knowledge about weather involves observation and the ability to take notes. Using simple tools a student can observe and note weather patterns.

Objectives

1. Make and record accurate weather observations.
2. Learn about cloud thickness.
3. Distinguish between hue and intensity of colors.
4. Develop effective tools and techniques for scientific measurement.

Materials and Equipment

Log book or personal computer. Weather news or reports (perhaps an on-line weather service as available on CompuServe.)

Challenge

Conduct your experiment in groups of two or more. Begin a two to four week log to record your daily observations of the sky where each of you live. The group will decide on two times per day that you will record your observations in the log. Always look at the sky with the sun behind you, and choose two areas of the sky to monitor. Your observation points should be at 45 degree angle above the horizon.

Warning: NEVER LOOK DIRECTLY INTO THE SUN!

The group will decide what words you will use to describe the different hues you may see. Pick a number to correspond to the intensity of the various hues. Include descriptions of the clouds and their brightness. Then each will write a brief description of what you see at both observation points each time you observe the sky. Include your notes about the weather at the bottom of each day's entry. Be sure to note temperature, barometric pressure, and whether it was sunny or cloudy, rainy, or clear.

Evaluation

At the end of the two to four week period each group will present their findings. Since the results will be from many different areas each group will respond to questions about their data, collection techniques and conclusions.

Questions to aid you in doing the Design Challenge.

1. How did the sun's angle in relation to the horizon affect what you saw at each viewing point? How was it different on sunny and rainy days?
2. What did you notice about the brightness of the thick and thin clouds?
3. When and where did you see the most intense colors? How might the cloud cover have contributed to what you observed.
4. Did the hue and the intensity compare to what you expected at the time you began the activity?

The Secrets of the Iceman

Walter F. Deal III

✦

Context

Imagine that you and a friend were exploring in a remote snow-covered mountain region and you came across the body of a partially snow-covered human being. At first, shivers may move up-and-down your spine! At second glance, your curiosity and observations would tell you that the leather-like body in strange clothing was from another time. On September 19, 1991 Helmut Simon and his wife, two German tourists, spotted what is now known as the Iceman. He was on the border of Italy and Austria. At first they thought it was a doll, but then they recognized the body as that of a human being. The couple suspected foul play and raced to get the authorities to examine the body. Thus, a little over a year ago, the greatest archaeological find was accidently made by two people hiking on the mountain slopes of Italy.

Scientists have never had the opportunity to examine such a remarkably well-preserved human specimen. The Iceman was nearly perfectly preserved and literally died with more than his boots on! Large pieces of clothing, neatly tailored and stitched, a nearly pure copper ax, a bow and arrows (several were unfinished and without feathers), some berries and mushrooms, a thorn from a deer's antler, a razor-sharp flint dagger, and other items were all found with the Iceman. The boots? They were a well-worn size 6 and stuffed with straw for insulation against the cold. He even had a tattoo on his body. It was as if the Iceman was frozen in his tracks—a snap-shot frozen in time. By using radiocarbon dating analysis, scientists have determined that the Iceman's time period was the late Stone Age, some 5,300 to 5,600 years ago!

Challenge

We often think of Technology Education as a multi-disciplinary study of tools, materials and processes and artifacts of civilizations of the past and present. As human civilizations progress and develop, the technology, language and culture change with them. Our artifacts tell a very accurate story about who we are and how we live. The Iceman lived and died over 5,300 years ago, but left us with a legacy of information that is sure to fill volumes of books about who he was, how he lived, and the technology his society used.

Imagine that you are a researcher with the opportunity to study the Iceman. You need to assemble a team of experts to study the Iceman's body, his clothing and tools, the bits of food that he was carrying, and his weaponry. Note that everything was nearly perfectly preserved, even bits of his hair! Assume that you have a team of three persons to help with your research. What kinds of experts would you choose? What do you think your research would reveal? Prepare a sketch of what your team perceives the Iceman looked like. Write a scenario describing the technologies that appear to have existed during his time. Present your analyses to the class.

Objectives

Apply critical thinking skills.

Use collaborative learning techniques to investigate the tools and technology that existed during the life of the Iceman in the late stone age.

Prepare a time line identifying major developments in the technology of tools and metals.

Use computer skills to collect and analyze data.

Use effective writing and presentation skills preparing and presenting a report about the life and technology of the Iceman.

Assess the impacts of the discovery of the Iceman on the history of humans and technological developments.

Resources and References Used

(Books, magazines, etc. used in completing this activity.)

Jaroff, Leon, "Iceman," *Time Magazine*. October 26, 1992, Volume 140, Number 17, pages 62–65.

Ross, Philip E., "Eloquent Remains," Scientific American, May 1992, Volume 266, Number 5.

Materials & Equipment

Sketch pad, pencils and colored pencils or computer, word processor, graphics and drawing software, and animation or presentation software.

Evaluation

1. Each research team is to identify several major disciplines or areas of expertise that would be appropriate for analyzing the Iceman.
2. Each team is to prepare a scenario about what life might be like 5,300 years ago.
3. Each team is to prepare and present a media-based report such as may be seen on an evening TV newscast describing a "Story of the Iceman."
4. Write a scenario or an assessment of how the team's findings will affect the history of humans and technology.

Construction/Manufacturing

David A. Baird

Project

Design and construct a game, toy or puzzle

Materials and Equipment

1-2″ × 1″ × 12″ fir
1-5⁄16″ × 12″ dowel
Standard woodworking tools and equipment

Rationale

Schools frequently are faced with providing experiences for students in technology education with little or no budget. Even when students are expected to provide their own materials some are not able to do so. Problem solving techniques applied to design and prototyping with limited materials can lessen the effects of these factors.

This activity can easily be the culminating activity for a unit on problem solving techniques and practices. It works equally well with materials other than a two by four. Of course, all students must be supplied with identical materials.

The problem

Given the instructor supplied materials, design and construct a game, toy, or puzzle. Nothing, other than glue, may be added. No finish is to be applied unless it is an integral part of the design, i.e. a checker board.

After the prototype is produced write an analysis of the time spent in original design formulation, initial construction, re-design, and final construction. This report will contain an analysis of the amount of waste that is unusable as part of the finished product. It will also cover the intended function/use of the prototype.

Students will make a formal presentation of their final prototype solution to the class. It will include a demonstration of the product's function/use and will also address the major problems encountered.

Objectives

1. Apply the problem solving method.
2. Produce prototypes of products.
3. Demonstrate the safe use of woodworking tools and equipment.
4. Employ the principles of design.
5. Generate a technical report.
6. Communicate orally with the language of technology

Evaluation

1. Unique Design 10 points
   - 10 totally new design
   - 8 modification of existing design
   - 6 existing design
2. Functionality 20 points
   - 20 consistently performs
   - 18 seldom malfunctions
   - 16 works better than half of the time
   - 14 works infrequently
   - 12 does not work
3. Quality of Workmanship 20 points
   - 20 quality with few if any defects
   - 18 minor defects not detracting from product
   - 16 defects distracting but not preventing function or overall acceptability
   - 14 major defects in workmanship
   - 12 incomplete project
4. Amount of Waste 20 points
   - 2% waste or less = 20 points
   - 1% waste = 16 points
   - 6% waste = 14 points
   - 8% waste = 12 points
   - over 8% waste = 10 points
5. Written Report 10 points
   - 10 no, or only minor errors in writing
   - 8 three errors in spelling, grammar or style
   - 6 four or five errors in spelling, grammar, or style
   - 4 over five errors in spelling, grammar or style
6. Oral Report 10 points
   - 10 complete and well delivered
   - 8 complete with few speaking problems
   - 6 presented with some errors of omission and delivery problems
   - 4 presentation was made

Graphic Advertising Utilizing Paper Engineering

Dan Brown

Interdisciplinary Aspects

Truly interdisciplinary in nature, this project affords the opportunity to incorporate the psychology of selling, the use of target audiences, and the use of language to persuade and convey information through the marketing/advertising component. The study of graphic design principles allows students to develop an increased appreciation of the visual aspects of communication. The study of kinematics allows students to begin to develop an understanding of linkages, motion, and vector forces. A brief exploration of the mathematics employed both in kinematics and in the layout of the graphic design could expose students to new, practical applications.

Context

In our world today, many dollars and much creative effort are invested by people preoccupied with the sale of their products, services, ideas, or candidates. The primary tool for these marketing efforts is advertising. Advertising is a process that strives to inform or persuade. It can be used to promote a name, an idea, or a product. Often advertising deals not in facts but in feelings, implication, surprise, humor, and emotion laden images. Most advertising is aimed at the subconscious levels of the brain. Emotion laden visual images may be more persuasive, and are often remembered longer than logic.

Advertising is essentially applied communication. Some key elements of efficient communication are targeting specific audiences, then selecting a medium that will effectively reach that audience. Television is effective as an advertising media because it can combine visual imagery with motion and sound to capture and hold the attention of the intended audience long enough to relay the message, but not all audiences can be reached efficiently through the television medium. The same communication concepts adapted to the limitations of other media can communicate your message very efficiently.

The use of humor in advertising is based largely on the memorable effect of surprise when they arrange for us to encounter ordinary things in very out of the ordinary situations or vise versa. Motion where none is expected combined with humor and/or striking visual images can accomplished a similar effect. This motion can be achieved through the application of paper engineering to graphic design problems solving activities.

Graphic designers are first and foremost expert communicators. The graphic design field is constantly searching for innovative techniques that will catch and hold the attention of target audiences; new ways to stand out from the flood of information and messages that we are bombarded with daily. One interdisciplinary learning activity that can allow students to improve their ability to communicate graphically while exploring engineering, mathematics, design and marketing concepts is to design a promotional item through the use of paper engineering, a design concept that has long been utilized in greeting cards and children's pop-up books to entertain, and market products or concepts. The marriage of design concepts and kinematics to create motion in a context that is usually characterized by static images can produce visually striking and effective results. Knowledge of the same kinematic concepts that are utilized to achieve motion in paper engineering can then be transferred by the student, through the aid of class discussion, to other technological devices.

Objectives

1. Increase consumer awareness of marketing techniques through the exploration of communication principles utilized in marketing and advertising.
2. Learn to apply basic graphic design principles (e.g. space, line form, color, balance, proportion, unity, and rhythm).
3. Increase understanding of basic kinematics principles as applied to the design of pop-up devices and other technological devices.
4. Become aware of mathematics applications in kinematics, layout and design.
5. Develop three dimensional visualization skills.
6. Provide opportunities for students to practice teamwork skills.
7. Provide opportunities for students to develop public presentation skills.
8. Improve student understanding of the use of language to persuade and convey information.
9. Practice creative problem solving skills.

Challenge

Break into teams of two or three. Your assignment is to design and produce a creative prototype of a brochure that will persuade prospective students to enroll in Technology Education. Your team should create or design appropriate slogans and persuasive copy or art work as needed. Pop-up art has existed for many years but recently it has made significant gains in popularity as a technique for use in children's books and some specialized advertising applications. Your final product will be a carefully designed three dimensional (pop-up) brochure that promotes Technology Education. Apply what you have learned about the use of space, line, form, color, balance, proportion, unity, and rhythm to your design.

Materials and Equipment

A. 8½ X 14 sheet of card stock or other heavy paper with the ability to spring back when folded. (2 sheets for each group).
B. Newsprint, butchers paper or other large paper for sketching, practice, and table protection (buy in bulk, and supply as needed).
C. Colored marker sets (1 set for each group).
D. Ruler
E. Scissors
F. Glue or rubber cement of type that sticks well to the paper type selected (1 container for each group).
G. Numerous magazines, newspapers, and clip art (or use computer to print graphics) which can be incorporated as paste-up into the prototype.

Procedure

1. Have students examine examples of pop-up cards and books and discuss the

possibilities and limitations of pop-up art in advertising applications.

2. Divide students into groups and encourage the use of brainstorming and thumbnail sketches to develop an appropriate theme, slogan, and over all visual presentation concept for the brochure.

3. Members of the group will experiment with the pop-up construction techniques illustrated in *Paper Engineering for Pop-up Books and Cards* (Hiner, 1985), study examples of pop-up construction brought from home, or design their own. Regardless of the pop-up mechanisms selected, careful attention to detail or the technical considerations listed with each design in Hiner (1985) will help assure success. Whether you chose to utilize a mechanism developed by others, or design your own, you will find that experimentation and/or careful mathematical calculation is necessary because the exact shape and placement of pop-up components varies with each individual design.

4. Final version of the brochure is assembled and readied for presentation to the class.

Analysis

Have students display or present their group projects to the class, attempting to persuade the class that the presenters' promotional design is the best. The class members will use a checklist to rate their own and their classmate's work. Grades will be based on mean scores awarded by the class. One important criteria for evaluation that should earn points is the creative use of surprise, humor, or other emotional devices. Points should be awarded for overall creativity, craftsmanship, and the effective application of art/design concepts taught previously (e.g. line, form, contrast, color, balance, etc.). Allow the class time to discuss the application of criteria where they wish.

The learning effectiveness will be enhanced if time is allotted for debriefing discussion after the analysis step. This post-activity discussion will allow the students to discuss observations and internalize and analyze the concepts and applications they have been exposed to in the course of the activity and analysis. It is also useful to note the differences and similarities in advertising techniques used in television, magazines, billboards, brochures, etc.

References

Hiner, M. (1985), *Paper engineering for pop-up books and cards.* Ipswich, Suffolk, England: Ancient House Press.

Emergency Shelter

Walter F. Deal, III

The shell of a manufactured home stands among the ruins of other homes in a south Dade County housing development (AP/Daily Press—Newport News, VA).

Context

The inter-relationships of *Communication, Transportation* and *Construction* can be readily seen as we view the effects of hurricane Andrew. Andrew started as a tropical storm in the Caribbean and moved northwest toward Florida while gaining strength. By the time that Andrew reached the coast of Florida it had increased in strength to a Force 4 hurricane! Andrew moved westward across south Florida, the Gulf of Mexico and into Louisiana with destructive forces that have not been seen in the history of the United States. Nearly 700,000 people were evacuated from the coastal areas of Florida. The death toll was 15 people—remarkably low for such a powerful storm. This can be attributed to the National Hurricane Center's accurate forecast of when and where Andrew would hit on August 24, 1992. Additionally, the cooperative efforts of local, state, and federal agencies provided emergency evacuation procedures.

South Florida seemed to be the most heavily damaged by the forceful winds of Andrew that exceeded 160 miles per hour. The storm destroyed thousands of homes, buildings, and public utilities such as water, energy, and communication services. The public utilities or infrastructure and the means of the distribution of goods and services were severely damaged. The devastation is hard to imagine! The estimated cost of hurricane Andrew's damage may approach $20 billion. People returned to where their homes once stood found piles of debris. They had no place to live, either temporary or permanent. Large tents were erected, but people found them less than satisfactory living arrangements and no privacy. Roads and highways were barely passable. No running water. No electricity. No radio and TV. Food, water, and shelter were in extremely short supply!

Government agencies moved into the Florida and Louisiana disaster areas to assess the destruction and assist in restoring public utilities such as water, communications, and energy. Distribution systems—roads and highways needed to be cleared and repaired so that needed supplies could be delivered to the disaster areas. Communications services such as telephones, radio and TV were destroyed.

Challenge

Housing and shelter remains a major problem for the disaster victims of hurricane Andrew! Sources of building supplies are extremely limited. The prices of basic building supplies such as two-by-fours, plywood, and siding increased substantially because the scarcity and making it difficult for the disaster victims to build temporary housing and shelter. City planners and relief agencies have issued a plea for architects and engineers to design low cost temporary shelter for families in the disaster areas of Florida and Louisiana.

The city planner's data base shows that the average family size is approximately three persons. The climate of the disaster areas are semi-tropical and require minimal needs for heating. The city planners have asked for shelter designs that are light weight, easy to assemble, low cost, provide reasonable weather protection, and are transportable by truck to needed locations. Can your design team meet the challenge of the city planners for this crisis?

Resources and References Used

(Books, magazines, etc. used in completing this activity.)

Objectives

1. Demonstrate creative problem solving and design skills.
2. Apply good construction techniques in designing temporary shelter.

Continued on page 30

The Cellular Connection

Walter F. Deal, III

Context

Today we give little thought in communicating across town or across the country using voice communication technologies or the telephone. Alexander G. Bell is credited for inventing the first working telephone in 1876. What would you imagine what it would be like living in a society without telephones? Before the invention of the telephone, couriers, messengers, and mail was used as a means of distant communication. The telegraph offer a means of distant communication but required specially trained operators to interpret or decode messages from one party to another.

Digital electronics, automatic switching equipment, microwaves, and satellite connections with have at our command a truly global communication connection. Over 90% of the population in the United States has a telephone in their home. Innovative developments in electronics has brought about new services for portable telephone users. Cellular telephones offer all of the advantages of regular telephones and are truly portable. We can use cellular phones in our homes, automobiles, offices and nearly anywhere you could imagine at work or recreation!

Today designers and engineers are consumer-oriented in designing new cellular phone systems for global markets. They are concerned with the technical features and aesthetics of the actual product. Design technology and material selection for packaging the cellular phone are a priority. Features such as high reliability, reasonably priced, feature-packed screen displays, speed and memory dialing, volume control, hands-free operation, long-life batteries, and etc are features that are typically available. The compact size of new cellular phones require miniature electronics and appropriate material selection for the design and manufacture of cases that are rugged and durable. Engineers apply ergonomic designs to meet the needs of consumers in producing reliable and attractive products.

Challenge

A wide variety of materials can be used in the manufacture of cellular phone cases. Plastics, metals, and composite materials offer specific advantages of strength, weight, durability, cost and ease of production. Your challenge is to design and construct a model cellular phone package, identify features that would be attractive to consumers and beat the competition. Your model should simulate a prototype design. You will need to specify the type of material that the case or package is to be made from and identify the advantages of the materials that you select.

It is suggested that you obtain product literature from several cellular phone manufactures to compare features, size, and costs.

Resources and References Used

(Books, magazines, etc. used in completing this activity.)
Product literature from companies like Motorola, NEC, Technophone, or others.

Objectives

1. Demonstrate creative problem solving and design skills.
2. Apply ergonomic principles in designing a cellular phone package.
3. Use drawing and computer tools to plan and design.
4. Use modelling materials to construct an actual size model.
5. Visit cellular telephone retailers to compare cellular phone products.

Materials & Equipment

Sketching pad, pencils, erasers, colored markers, acrylic paints, modelling clay, computer, printer, drafting tools, CAD software, styrofoam, construction paper, or other modelling supplies.

Evaluation (includes feedback):

1. Present your completed cellular design to the class, identifying unique features, and user considerations.
2. Describe why your product design is better than competitive products.
3. Assess the impact that cellular phone technologies will have on communications and manufacturing.
4. Write a scenario describing the social and economic impact of cellular telephone technology.

Continued from page 29

3. Use drawing and computer tools to plan and design.
4. Use architectural modelling materials to construct a scale shelter design.
5. Visit the school library or guidance office to research career opportunities, qualifications, education and training requirements, working conditions, and salary ranges for the related careers in the construction industry.

Materials & Equipment

Sketching pad, pencils, erasers, colored markers, computer, printer, drafting tools, CAD software, foam core board, construction paper, or other modelling supplies.

Evaluation (includes feedback):

1. You are required to present your completed emergency shelter design and an overview of your career choice to the class.
2. Describe the unique construction features of team's design.
3. Assess the impact that your emergency shelter design could have in meeting the shelter needs of hurricane Andrew's victims.

—*W.F.D.*

Columbus Sailed the Ocean Blue

Cindy Etchison

Background Information
Explorers/History
Ages 8–12
The teacher should obtain the materials for the testing tract and set it up in a wet & dirty area, with access to an electric outlet. The teacher will want to discuss the safety factors involved when using water and electricity. Various materials can be used for the body, mast, and sails of the boat. Encourage students to fasten these materials in a variety of ways besides using a hot glue gun (yarn/string for tying or sewing; sleeves for insertion of the mast, angle brackets for connecting the mast to body, or a hole in the body that makes a tight fit for the mast). A skill knife can be used to cut the material used for the body of the boat. Encourage the students to make a paper template before beginning to cut any material. Provide a variety of materials, so that students can explore weight and size.

Resources
"Men, Ships, and the Sea" by Capt. Alan Villiers for the National Geographic Society

Materials and Equipment
Testing tract: wall paper tray, rain gutter, or other pan of approximately 3 feet long, hair dryer or small electric fan, and a stop watch for time trials.
Consumable materials: plasticine, styrofoam, wood scraps, fabric scraps, plastic wrap, plastic containers and lids, cardboard, dowels, popsickle sticks, yarn, string, rubber bands.

Context
Students have been studying about Christopher Columbus and his discovery of America in 1492. Discuss how water travel had been done up to that point in history. Discuss the various reasons why the sea had been travelled and explored by many civilizations (Chinese, Arabs, Greeks, Indians, Vikings, etc.).

Columbus and other great sailors changed the world with their voyages of discovery. He had set out for Japan, a trip that he calculated to be 3,000 miles. Instead, he found a new continent. The *Santa Maria* was 90 feet by 20 feet, smaller than a tugboat. The ship averaged about 100 miles a day. He made the first 33-day run across an unknown ocean.

This design brief can be used to demonstrate the forces acting upon sails and the idea of distance and time. Columbus also had to use navigational aids such as the stars and charts. Columbus' mistake (not getting to Cathay) sprang from the lack of knowledge of geography at that time. Maps of that day underestimated the size of the earth, showed one ocean (the Atlantic) between Europe and Asia.

Challenge
Plan and build a sailboat that travels a distance of 3 feet as quickly as possible. Determine the width of the tract and choose a material for the boat that has buoyancy. Select the material, shape, number, and placement of the sail(s). Decide on the methods of joining the various materials that you choose. The craft should be sturdy enough to withstand the journey.

Objectives
1. Students will apply the problem solving method.
2. Students will produce prototypes of products.
3. Become aware of how sails can power crafts.
4. Investigate the properties of various materials and select appropriate ones to complete a task.

Evaluation
The boat should be buoyant, be sail powered, travel 3 feet, and remain sturdy enough for another voyage.

Related learning concepts

Language
research the various kinds of sailing ships (sloop, brigatine, schooner, bark, etc.)
research the names of the sails and parts of a ship

Social Studies
what cities have been named for Columbus?
what celebrations have been planned to celebrate the 500 year anniversary of his discovery
locate the path of his trip using maps and globes
research other explorers: Magellan, Cabot, Hudson

Math
obtain a nautical chart and locate landmarks, longitude/latitude, and depth markings. Chart a course from one point to another. graph the results of the distance & time trials

Technology
research the navigation aids that are in use today practice "seamanship" by tying various knots (splice, figure eight, sheepshank, bowline)
develop a timeline that shows the develop of sea vessels (from log rafts to paddle-wheels to tankers

TECHNOLOGY LEARNING ACTIVITY

Tax or Regulate

Walter F. Deal, III

Context

The United States is one of the wealthiest countries in the world, yet it has a staggering national budget deficit of more than $320 billion! There are many arguments for increasing income taxes, adding new taxes, reducing taxes, and cutting entitlement programs. It appears that there are as many proposals for reducing the national deficit as there are dollars of deficit. One proposal is to increase the federal gasoline tax. The federal tax on gasoline is now 14.1 cents per gallon. It is estimated that over a five year period a 50-cent increase in the gasoline tax could reduce the deficit 15 percent by 1997.

Strangely enough, Detroit auto makers support increasing the gasoline tax. The automakers prefer an increase in the gasoline tax rather than increasingly tough fuel economy standards. Currently, U.S. automakers produce compact automobiles that exceed federal fuel mileage requirements. These smaller automobiles use less fuel than full-sized cars and produce fewer emissions. However, consumers prefer large and more powerful automobiles, thus creating little demand for the compact fuel efficient automobiles.

Federal fuel efficiency regulations were enacted because of the 1973 Middle East oil imbargo. During that time, price of gasoline reached an all-time high. Not only had the price of gasoline increased, it became very limited in supply. There were long lines of consumers waiting for their turn at the gasoline pump. Subsequently, Congress passed regulations in 1975 that required automakers to increase the gasoline mileage of their automobiles. The regulations are called CAFE (Corporate Average Fuel Economy) and required that auto manufactures meet a 27.5 mpg average rating for all passenger cars that they manufactured by 1990. This is the current standard.

Automobiles manufactured in 1973 averaged 13.2 miles per gallon and by 1991, the average had increased to 27.3 mpg. Currently there are some proposals to increase the CAFE to 31 to 33 mpg by 2001 and other proposals to increase it to 40 miles per gallon.

The purpose of CAFE is to require automakers to design and produce more efficient automobiles, reduce our dependence on imported oil, and reduce automobile emissions. However, there have been several factors that were not anticipated or expected. These included increased concern for auto emissions and pollution, the decline of gasoline prices in real terms, and consumer behavior. In 1960 the adjusted price for gasoline was $1.45 and in 1992 is only $1.12 per gallon. Automobile gasoline mileage has doubled during the last twenty years and people allowing people to drive larger, less fuel efficient automobiles without increasing their fuel costs. People have substantially increased the number of miles that they drive annually because of low cost fuel and improved fuel economy. This increase in driving activity has also caused the numbers of traffic related deaths to increase.

Challenge

Many proposals have been presented on the dilemma of the national deficit. One proposal calls for increasing the cost of gasoline through a tax to reduce the national deficit over the next five years. Ironically, the U.S. automakers support a gasoline tax that directly affects the products that they manufacture. Your challenge is to prepare a scenario that addresses the benefits and negative consequences of increasing the CAFE or increasing the gasoline tax.

It is important to consider a broad perspective of this problem. Factors such as people in various income groups, manufacturers, automobile designs, businesses, the environment, inflation, social security retirees, and the national deficit must be a part of your team's scenario. Additionally, how would citizens respond to their Congressional representatives. Remember, these are tough decisions with differing consequences for consumers, business, and industry.

Objectives

- Apply critical thinking skills.
- Use collaborative learning techniques.
- Use effective writing and presentation skills preparing and presenting an oral report.
- Demonstrate positive attitudes toward efficient energy use.
- Assess the impacts in using policies that employ taxation and regulations.

Resources and References Used

(Books, magazines, etc. used in completing this activity.)

The World Almanac and Book of Facts (1992).

Materials & Equipment

Note pads, pencils, write-on transparency film, markers, and other presentation materials.

Evaluation

1. Each policy team is to give an oral report describing the benefits of their scenario.
2. Based on their findings, the teams are to present a report and recommendations to the class.
3. Use creative presentation strategies in presenting the team report.
4. Write an assessment describing how your team's recommendations will affect the national deficit, consumer behavior, auto manufactures, fuel needs, and etc.

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